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LABORATORY EXPERIMENTS IN ECONOMICS: THE IMPLICATIONS OF POSTED-PRICE INSTITUTIONS

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Science,
forthcoming

SOCIAL SCIENCE WORKING PAPER 597

March 1986

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ABSTRACT

A laboratory experimental methodology has been developing in economics in recent years. The nature of the methodology is to integrate clearly motivated but largely subjectively determined human decisions with the organizational features of markets. The article summarizes the nature of the incentive system and how market organization can be used as an independent variable. Initial basic research results that involved the assessment of the effects of posted price organization demonstrated that the effect of the institution is to raise prices and lower market efficiency. The existence of such effects and the close proximity of the laboratory posted price institution and rate posting institution required by the government in several industries has led to a series of policy related experiments. The results have also led to more basic research efforts on seemingly unrelated topics.

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For several years laboratory experimental research in economics has been rapidly expanding. The number of papers published annually has increased from two or three in the 1960's to over 70. Laboratory experimental research in economics was being done at no more than one U.S. university at any given time in the early 1970's while over 20 universities are involved now. Major topics have expanded from one area of applied game theory (the oligopoly problem) to include almost every subfield of economics and some of the management sciences. Research that was purely basic a few years ago has already had policy applications.

This article examines the experimental treatment of one topic that has been important to the increased interest in the methods: the implications of posted price institutions. The experimental methodology is explained first and then the nature of the results and the applications are summarized.

Traditionally, economics has not enjoyed the benefits of an experimental methodology. Naturally occurring economic processes are so complex that complete experimental control with multiple replications defies the imagination. Yet, in spite of that seemingly

insurmountable obstacle, the methodological posture taken by experimentalists is straightforward. General theories intended for application in complex markets should be expected to work when applied to the simple special cases. Such theories that do not work in the special cases should be discarded or modified in light of the failure. In order to create the necessary simple special cases, significant financial incentives are used to create markets in which buying and selling take place and in which people actually keep the profits they make. General theories about the development of prices and the pattern of trading and profits are tested. It is hoped that the experience gained from the operation of the simple markets will lead to a deeper understanding about the behavior of complex systems where experimental testing is impractical. The laboratory data help screen models that are ultimately to be applied to much more complicated situations. In this sense laboratory markets serve as an additional source of data about how the complicated world works.

Much current research can be traced to two discoveries about the behavior of laboratory markets. The first discovery, which evolved from research in the late fifties and early sixties, was that a market equilibrium model could be used to predict and explain several important behavioral features of laboratory markets. One implication of the discovery and subsequent research is that reliable principles of market behavior exist. The second discovery was that the posted price form of market organization has an influence on both prices and market efficiency. This second discovery provides an

important empirical connection between market organization and performance. While connections between market organization and performance were demonstrated experimentally many years ago (1), the posted price institution is different by virtue of its relationship to the tools that are used in market regulation and policy.

THE CREATION OF A MARKET

Substantial differences exist among laboratory markets, but similar procedures are used to create them all. Laboratory markets can differ by the number of people participating and the relative market shares of participants. Some markets are influenced by random events with information about those events differing across participants, while other markets have no uncertainties. Market organizations can differ as do the posted price markets and double oral auction markets discussed in the next section. In spite of many differences the basic approach is the same.

Subjects are typically college students but experiments exist with subject pools that range from high school students to employed adults. On occasion an effort is made to use only subjects from some particular industry. The differences among subject pools have not been sufficient to motivate intensive testing of different subject pools.

In simple experiments subjects are randomly partitioned into a set of buyers and a set of sellers. Instructions are read and subjects are either tested on the market rules and the financial incentives or given a practice session or both. The parameters on

economic models that predict market behavior are sensitive to the exact nature of incentives. While much latitude is left for subjectively determined individual decisions, care is taken to avoid incentives not precisely controlled by the experimenter. The commodity traded is never given a name, and references to specific commodities or markets are avoided. If subjects neglect the controlled incentives in order to act as they imagine they or someone else in some particular market might act, the control necessary for testing quantitative models is lost.

The diagram in Figure 1 identifies the nature of incentives and controls that are common across experiments. The incentives are profits that the subjects actually keep. Buyers in a market purchase units from sellers by paying real dollars for them. The buyer then resells units acquired in the market to the experimenter at the end of a trading period or trading day. The difference between what a buyer pays for units in the market and what the buyer receives when redeeming them with the experimenter are the profits that the buyer keeps for himself. This profit potential is the only reward or incentive that the buyer is given. In formal terms each buyer, i, is given a redemption value schedule, $R_i(x_i)$. This function identifies the gross income the subject buyer will receive from the experimenter if the buyer acquires x_i units in the market and can be called an "induced value" (2). The net income that the buyer keeps for his own is the difference between $R_i(x_i)$ and what i paid to sellers when purchasing the units. The theory of competitive demand maintains that

the function $R_i(x_i)$ can be transformed into a new function, called the individual demand function (3).

$$x_i = D_i(p). \quad (1)$$

The function can be interpreted as the quantity that i would purchase if facing a fixed price p at which any quantity desired can be obtained. Equation 1 is a theoretical construction derived from theory as applied to the incentives the subject is known to have. Behavior could be something very different.

Sellers are given cost schedules $C_j(y_j)$ that identify the amount that seller j must pay the experimenter should (s)he sell y_j units to buyers. The profit actually kept by the seller is the difference between the receipts the seller gets from selling units to the buyers and the cost of those units. The potential profit is the total incentive provided sellers. The idea is also shown by Figure 1. Application of the theory of competitive supply (4) yields individual supply functions,

$$y_j = S_j(p). \quad (2)$$

The function (Eq. 2) can be interpreted as the quantity that i would sell if a constant market price p existed at which (s)he could sell any quantity desired. Again, the theoretical nature of Eq. 2 should be made clear. The function is postulated before any behavior of subject j is observed.

The law of supply and demand can now be applied. According to

the model market price will be that which equates market demand (the sum of individual demands) to market supply (the sum of individual supplies).

$$\sum_{\text{buyers}} D_i(p) = \sum_{\text{sellers}} S_j(p). \quad (3)$$

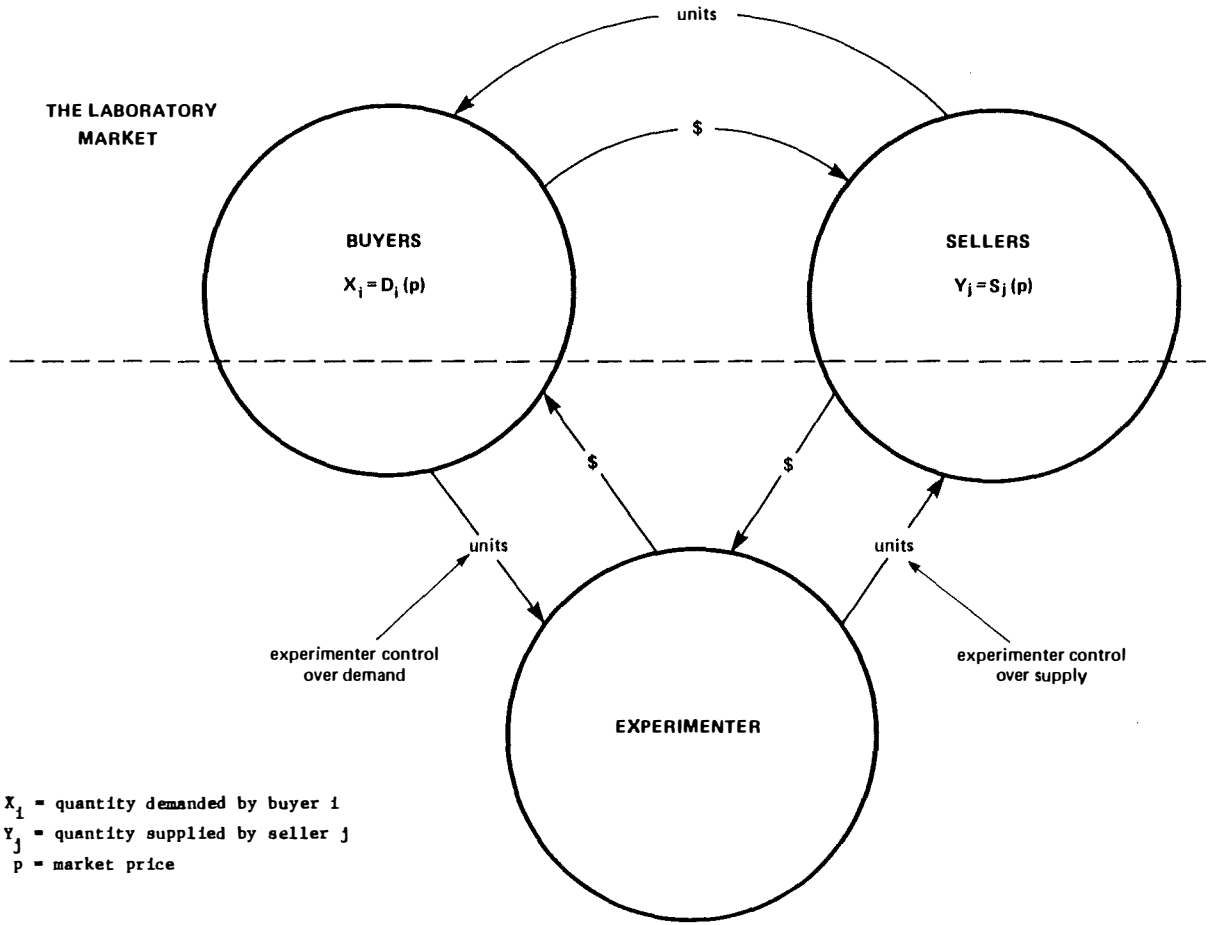
That is, the solution to Eq. 3, $\hat{p}$, is the predicted equilibrium price. Market volume is predicted to be the quantity $\sum_{\text{buyers}} D_i(\hat{p})$. Efficiency of a market in a cost/benefit analysis sense is maximized by a pattern of trades that maximizes the total earnings of all participants. Market efficiency as predicted by the model is 100 percent.

The efficiency feature, while easy to understand from the theory, is nevertheless rather striking. According to the model the total earnings of participants will be maximized even though (i) each individual knows only his/her own incentive functions and not those of others; (ii) individual discussions about their incentive functions are precluded by the rules; and (iii) subjects know nothing of the theory and could probably not solve the relevant optimization problems even if all information was available to them. The theory suggests that the efficiency levels will be attained as a result of decentralized actions taken by individuals who are presumably acting on the basis of their own self-interest. The idea is a version of Adam Smith's invisible hand.

The markets are open for a fixed period. Trading takes place and usually a number of contracts are made. The market is closed and

FIGURE 1

Structure of Incentives in a Laboratory Market



X_i = quantity demanded by buyer i

Y_j = quantity supplied by seller j

p = market price

profits are calculated. The market is then reopened for the next period with traders operating from the schedules relevant for that period. Frequently the schedules remain unchanged for a number of periods. The price patterns, income, and efficiency levels can be compared with those predicted by the model.

MARKET ORGANIZATION

The model as outlined above makes no explicit reference to market organization. However, from its inception, the theory has been constantly evolving to capture the potential importance of organization. Most people are unaware of the many different types of market organization. For example, in the United States people are familiar with the English auction in which prices are bid up and the item is awarded to the last (highest) bidder at a price equal to his/her bid. By contrast, the Dutch flower auction is almost the inverse. A "price clock" is initially set at a very high price. The price falls with the hand of the "clock" until someone stops the descent. The item is sold at the price indicated on the clock to the person who stops the clock. Sealed bid auctions are yet another common type of market. Bids are usually tendered privately and opened simultaneously, but the method of determining price differs according to the market organization. According to the first-price auction, the item goes to the highest bidder at the price bid. By contrast, in a second-price auction the high bidder is awarded the item, but the price paid by the high bidder is the price bid by the second highest bidder and not the highest bid.

The list of alternative types of markets is long. When faced with such alternative ways to organize a market, which should be chosen? What difference does it make in terms of prices and efficiency? Questions such as these motivate experimental research.

THE ORAL DOUBLE AUCTION AND POSTED PRICES

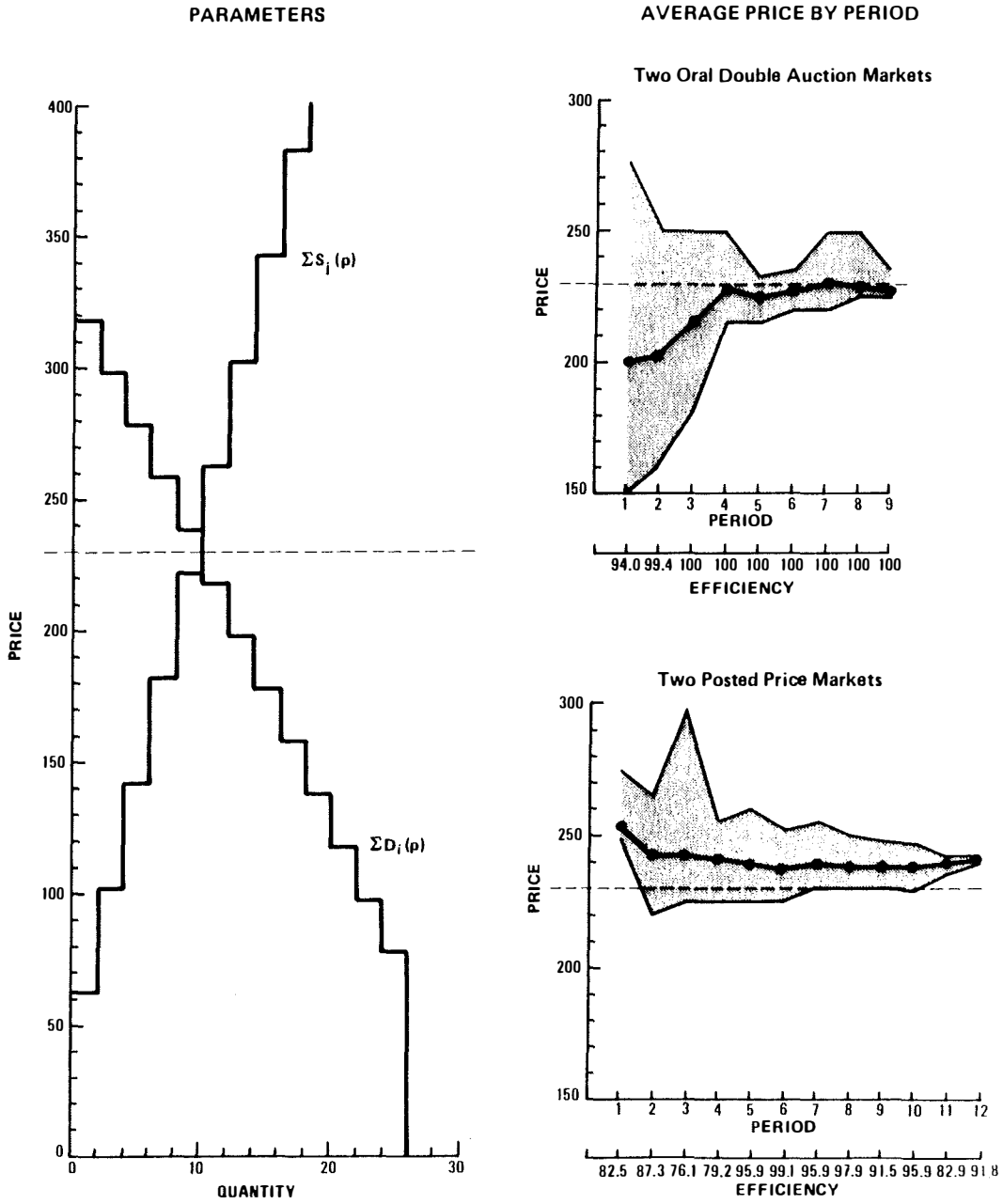
The two types of market organization to be discussed here are the oral double auction and the posted price institution. In the oral double auction both sides are active. Buyers verbally tender <u>bids</u> to buy one unit of the commodity, and sellers verbally tender <u>offers</u> to sell. The outstanding (last) bid to buy and offer to sell are publicly displayed for all to see. At any time a buyer is free to make a higher bid, thereby replacing the outstanding bid with a new (higher) bid, or to accept the outstanding offer to sell. Similarly, any seller is free to tender a lower offer than the outstanding offer or accept the outstanding bid. If the outstanding bid or offer is accepted, the person who tendered the bid/offer and the person accepting have a binding contract at the specified price for one unit. After a contract the floor is open for new bids and offers of any amount. The dynamics of the market are characterized by many bids and offers converging to a formal contract. Contract prices normally differ from unit to unit.

The oral double auction market experiments are usually characterized by lots of activity as subjects yell their bids or offers to the auctioneer. The role of the auctioneer is to record the outstanding bids or offers on the chalkboard where they remain until

accepted or replaced by better bids or offers from other subjects. Recent computeriziation of this type of market has removed much of the noise but the fast pace remains.

The posted price institution has more similarities with a rate bureau than an auction. The market is not so filled with activity as is the oral double auction. In a posted offer (as opposed to posted bid) market each seller submits a price, presumably in a sealed bid fashion without benefit of consultation with other sellers. All prices are publicly posted, typically on a chalkboard, and cannot be changed by the seller for some fixed period. Buyers first approach the lowest priced seller who can sell only at the posted price and who sells units until (s)he wishes to sell no more at that price. As the low price sellers "stock out," buyers then move to the higher priced sellers. Since buyers will seek the low price advantages of the first buyer, a random device is usually applied to determine orderly access. After all buyers have had an opportunity to purchase, the period ends and sellers make decisions about the next period prices.

The results of two experimental oral double auctions markets are shown in the top panel of Figure 2, and the results of two experimental posted offer markets are shown in the bottom panel. Each market consisted of four buyers and four sellers. The graph in the left of the figure is the market demand and supply model constructed from the parameters. The parameters of all markets were the same but the participants differed. In the top panel the average price during the first period of the two oral double auction markets is shown as



$S_j(p)$ = supply function of seller j

$D_i(p)$ = demand function of buyer i

p = market price

FIGURE 2
Parameters and Average Price per Period
for Oral Double Auction and Posted Price Markets

the first dot and the average price during the second period is shown as the second dot. The price range during the period is the shaded area, etc. Similar data are shown for two posted offer markets in the lower panel. The results of these markets are typical of data that have been generated by many replications. Many different types of subjects have been used ranging from high school students to employed adults.

Each market consisted of a series of market periods or trading days. Each period lasted for about five minutes during which trading took place. After the period profits were calculated, the experience was then replicated with each participant facing exactly the same incentives as in the beginning of the first period. Each market lasted for about ten periods.

MARKET PERFORMANCE

Two aspects of market behavior are of interest. First, with repetition under fixed conditions the market prices are near those predicted by the model, and efficiencies approach the 90 to 100 percent levels. Secondly, prices tend to be higher for posted price markets than for oral double auctions (about ten cents higher in these markets) and efficiencies are lower. Compare the efficiencies in the low 90's for the posted price with the 100 percent efficiencies of the oral double auction.

The implications of the first aspect, the equilibrating property, should be emphasized. As can be seen from the figures, the simple demand and supply model works reasonably well under both

institutions, in the sense that other widely held beliefs can be dismissed in favor of this model. For example, a strictly held labor theory of value can be dismissed as being applicable to these markets. Labor had nothing at all to do with the development of prices so price formation in these markets is governed by completely different principles. Particular personality or other psychological characteristics do not seem to be necessary for the price convergence except to the extent that they are operative in allowing people to function, read the instructions, calculate profits, etc. Collusion does not automatically develop among sellers even though a harmony of interests in keeping price high is immediately apparent to all. Experiments have been conducted with a large and variable subject pool that has substantial differences in age, ethnic background, etc. Major subject pool differences have not been detected to date.

The key to the price formation process is captured by the simple theory of demand and supply, but generalizations should be offered with caution. Complicated naturally occurring markets can be characterized by a host of features that were not present in the laboratory markets. As such features become recognized the stage is set for new experiments that determine their effects.

The second aspect of the markets reported in Figure 2 serve to emphasize the cautionary note. The posted price institution induces an upward pressure on prices. It also has a downward pressure on efficiencies even though it is not readily apparent in those particular markets. This result signals a potential delicacy about

market performance by noting how it can be influenced by subtle features of market organization.

The relative effect of the posted prices was first demonstrated by Plott and Smith (5) by comparison experiments. The phenomenon had actually been observed earlier by Williams (6) who thought it was due to the fact that individuals could trade multiple units. Cook and Veendorp (7) also observed the phenomenon and attributed it to asymmetries in information. Even now no theory about the influence of the posted price institution has been published, but the effect has persisted under a variety of parametric situations. Extensive replications can be found in Ketcham et al. (8). Markets with speculators were investigated by Hoffman and Plott (9). Markets with a relatively large number of sellers were studied by Hong and Plott (10). Mestelman et al. (11) studied markets in which sellers acquired and paid for units prior to sale. A variety of demand and supply configurations and asymmetries were studied by Davis and Williams (12). The higher prices and lower efficiencies of posted price markets, relative to the oral double auctions, have held up so far.

FURTHER DEVELOPMENTS

What began as an interesting basic research result stimulated other research questions and also found its way into policy applications. Figure 3 is a flow chart of the research and applications that have followed from the initial posted price study by Plott and Smith. The first set of applications led to an

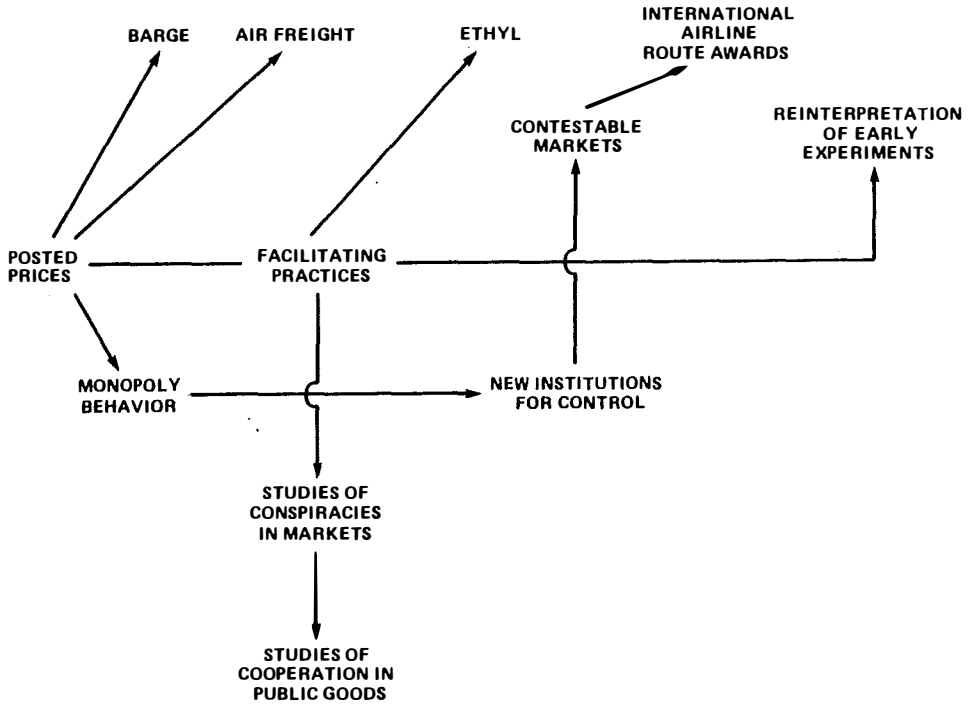


FIGURE 3

The Connections among Research Topics

understanding of the posted price institution as a facilitating device that helped one side of a market gain an advantage over the other. A second line of investigation was stimulated by the recognition that the institution might be used as a means of control of monopoly. That is, the posted bid institution might be used as a decentralized method that helps one side (customers) overcome an inherent advantage of the other side (a monopoly). A third line of investigation that developed from the other two, rested on the recognition that the institution helps overcome a classic problem in public finance, the free rider problem. These developments will be outlined in the next section. Finally, a recognition that the posted price institution has such an independent effect on behavior has led to a reinterpretation of many experiments conducted in the 1960's (13).

APPLICATIONS

Soon after the discovery of the posted price phenomenon, the Department of Transportation became concerned about a proposal to require freight rate posting for dry bulk, inland-water barge traffic. The railroads, which compete with the barges for dry bulk traffic, claimed that freight rate posting would improve performance of the barge industry. Sellers would be free to post whatever prices desired with the Interstate Commerce Commission. Such price postings would be publicly available and would dictate the terms of all sales. Any seller would be free to change its price if the ICC received a thirty-day advance notice. The railroads argued that public information on prices would make prices more competitive and protect

small barge owners from large barge owners who were allegedly making secret price concessions. The Hong and Plott study was first commissioned to study the claims of the railroads. A laboratory industry was created that reflected the prominent statistics for an appropriate section of the Mississippi River. Demand elasticities, supply elasticities, relative market sizes of buyers and sellers, demand shifts, etc., were those of the industry. The absolute market sizes and the time frame were scaled down dramatically to accommodate existing laboratory technology. Experiments were conducted with the posted price institution as proposed by the railroads, and also with a market organization (privately negotiated prices) that is similar to the organization that had naturally evolved.

The results of these experiments were the opposite of those that would be predicted by the railroad industry's analysis. Contrary to the railroads' claims, the posted price institutions caused prices to go up, efficiency to go down, and the small participants to be disadvantaged. The implications of the experimental results were to raise questions about the railroad industry's analysis and to place a burden on those who advocated price posting to explain why the policy they were proposing had such deleterious effects when examined under laboratory conditions. The proposal was dropped.

The posted price research was used again in 1979. The air-freight forwarding industry posted prices with the Civil Aeronautics Board in a manner similar to that which had been proposed for the barge industry. After deregulation the CAB was forced to decide about

how the industry was to be organized in the future. Citing the experimental literature on the effects of posted prices, the CAB issued a notice of proposed rule making calling for the abolition of the posted price institution. After having reviewed the response, the CAB eliminated all aspects of rate posting. Clearly the experimental work did not provide a scientific basis for a decision about the organization of the industry. However, the experimental results did provide the only source of background data about the potential effects of a policy decision and a presumption about what those effects might be.

The importance of posted price research took on a new dimension when the Federal Trade Commission noticed a possible relationship between posted prices and certain industrial practices that had evolved in the lead-based, antiknock compound industry. The FTC brought action against Ethyl Corporation, E. I. DuPont, Nalco Chemical Company, and PPG Industries for four practices that existed in the industry. The individual contracts of these sellers contained language that obliged sellers to 1) absorb all transportation costs; 2) meet the lowest price of any competitor or release buyer from any obligations; 3) deliver to buyer at the lowest price received by any other buyer; 4) provide buyer with a thirty-day advance notice of any price change.

One theory of these practices, which is consistent with the FTC complaint, holds that provisions 1 and 3 operate to eliminate secret price concessions similar to the way rate posting might do.

Condition 2 operates to reduce the incentive to lower price by assuring that price decreases are met immediately by competitors. Condition 4 operates as a vehicle to coordinate price increases through a policy of announcing a price increase in advance of the thirty-day deadline. The price increase is thereby made contingent upon a favorable competitor's response before the deadline. The net effect of all these practices according to the government's theory, would be to raise prices above the demand and supply equilibrium as defined above in the earlier section.

The defense advanced a competing theory. Two sellers of about equal size accounted for approximately 70 percent of industrial sales; the other two sellers were of about equal size. With such a high degree of concentration and the existence of excess capacity, sellers realized that price decreases would stimulate a competitive response. Sellers anticipating this reaction would keep prices high. Industrial structure would account for high prices and profits, according to this theory, and not the practices as claimed by the FTC so the relief sought by the FTC would have no effect.

Experimentation was of interest to the FTC in the context of possible rebuttal evidence. Is it true that industries with structure and concentration like those of the lead-based, antiknock compound industry, will necessarily maintain prices so high that the practices will have no room for an effect? The experiments reported in Grether and Plott (14) were designed to answer that question. Many market experiments were conducted with laboratory industries that had the

same concentration measures and numbers of participants as the industry. Demand and cost elasticities were the same as those thought to characterize the industry. Of course the actual magnitude of prices and costs were scaled down to manageable numbers for the laboratory. Figure 4 contains the results of one market that operated without practices for several periods, then operated with the practices for four periods, and then with practices removed operated for an additional three periods. The results are typical of the experimental results from several replications that the collective effect of all practices is to increase prices. The magnitude of the effect depends upon the baseline practices that one hypothesizes would exist should the FTC have won the case. The claim of the defendants that concentration alone, unaided by practices, unnecessarily fosters collusionlike prices is incorrect.

The nature of the contribution of experimental methods should be made clear. All interesting questions have not been answered, and some of the most interesting might not be answerable with experiments. The question addressed in the Ethyl experiment was: is the general theory offered by the defendants reliable? That question, which is the content of rebuttal testimony, is answerable experimentally. The question not asked was: do the practices make a difference in the lead-based, antiknock compound industry? The latter question was the one posed for the court and could probably not be approached experimentally. The first question is only one step in answering the second. The data were not introduced as rebuttal testimony so the

treatment by the court has not yet been tested (15).

The recognition that posted prices constitute a facilitating device has stimulated a basic research effort as opposed to an applied research effort. If posted offers tend to raise prices, perhaps posted bids by buyers could be used to lower prices when buyers face a monopoly seller. The flip side of a facilitating practice might be a tool for control. It just depends upon whom one wants controlled. This observation by Smith (16) led him to ask a more general question. Can institutions and organizations be used to control monopoly pricing?

Figure 5 shows the results of two of Smith's experiments. Both markets have only a single, monopoly seller. When the monopolist must use the oral double auction, prices tend to be lower than when monopolists use posted prices. Such results demonstrate the reasonableness of Smith's question and suggest that the answer is yes.

The Smith research was the first to initiate a laboratory study of monopoly. The results, that the classical monopoly model was not always reliable and that the reliability depended upon market organization, set the stage for a series of additional studies of monopoly. The most prominent are those that focus on "contestability theory."

The theory of contestable markets grew from an attempt to find alternatives to the traditional administrative rate setting process of regulating monopolies (17). Competition has traditionally been regarded to be unworkable in certain types of industries in which

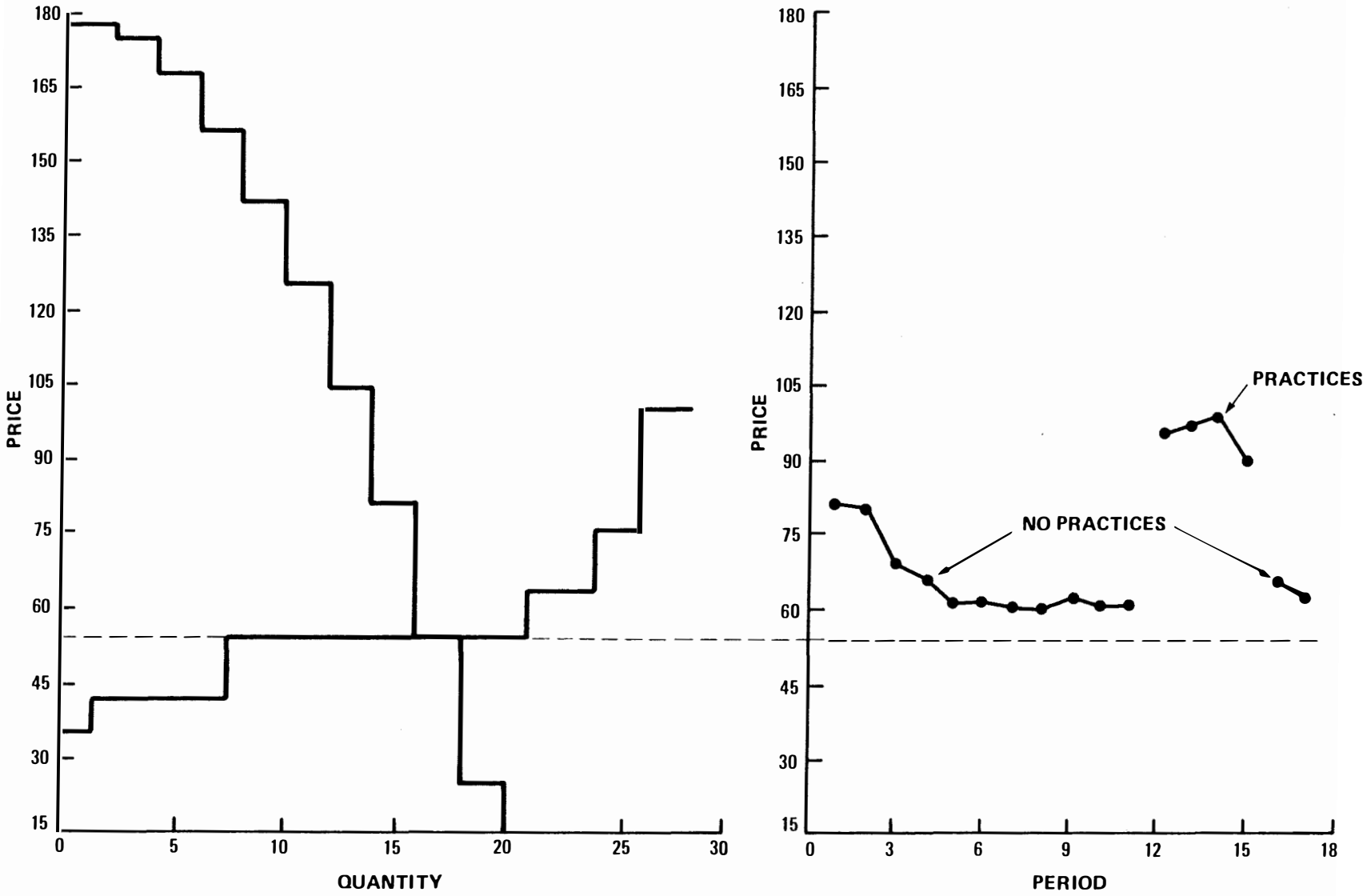
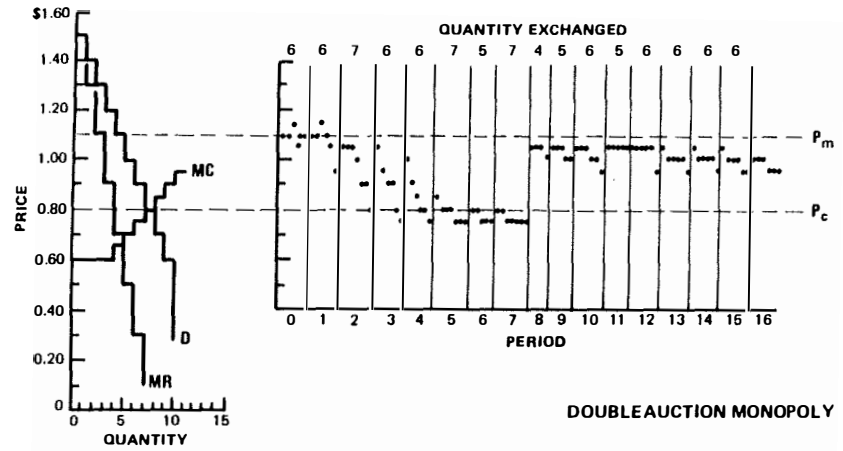
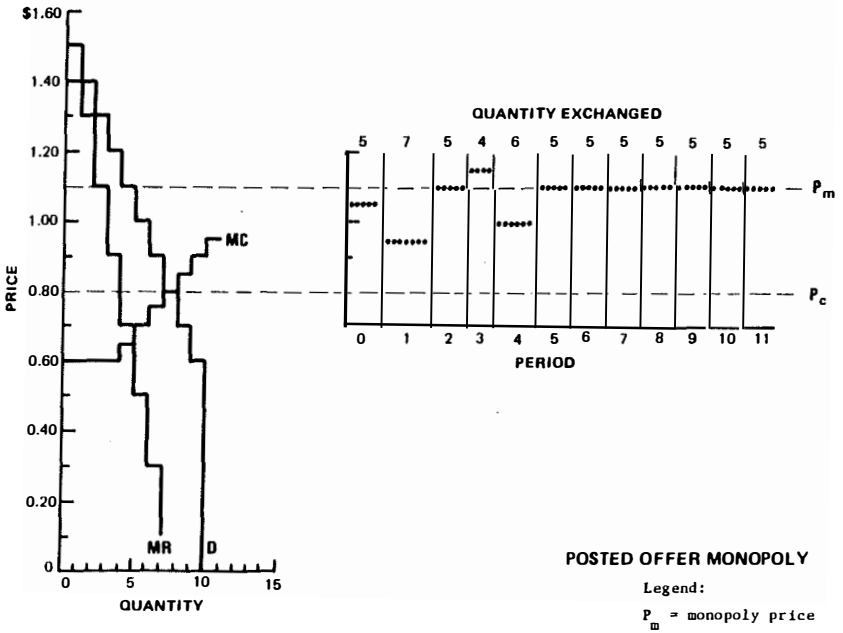


FIGURE 4: Parameters and Average Price per Period





Legend:

P_m = monopoly price

P_c = competitive price

MC = marginal cost

D = market demand function

MR = marginal revenue

FIGURE 5 Parameters and Contract Prices in the Order of Occurrence for Two Markets

Source: Double-Auction Monopoly (16, Chart 3, p. 91) and Posted-Offer Monopoly (16, Chart 5, p. 93) © 1981 Purdue Research Foundation.

costs continue to fall with volume. The basic idea of contestability theory is that potential entry together with an organized method of facilitating entry can effectively maintain prices below monopoly levels even though a single seller necessarily exists. No politicized rate setting process would be necessary. In effect, sellers post prices and the seller with the lowest posted price supplies the whole market. Because of the importance and complexity of monopoly regulation, the theory has been a subject of substantial interest.

The role of experimental economics has been to supply data where no other source of data exists. Markets purposefully organized along the lines suggested by contestability theory do not exist, and firms in monopolized markets are not likely to offer their markets as field experiments. Relative to the cost of field experiments the cost of laboratory experimentation is nothing, even with highly rewarded adults as subjects. The cost of a field experiment would be measured in tens of millions of dollars as opposed to thousands. The laboratory methods are also forgiving in the sense that many alternative ideas can be probed and "debugged" prior to any large data-gathering effort. The first experiments with contestable markets (18) provided clear evidence that the theory could work. Subsequent basic research (19) has centered on special cases for which competing theories suggest that contestability theory will not work. Those basic research efforts have led to modifications of the theory and to a deeper understanding of the type of actual market organizations that help the theory work. The experimental work and organizational

suggestions found in that research formed the basis of a method of awarding monopolized international airline routes (20). Such routes are monopolies by virtue of bilateral agreements with other countries, and the problem is to deoide which carrier gets the right to operate on the route.

The third line of investigation that was stimulated by posted price research takes a surprising turn toward issues in a different area in economics--public finance. The connections with this new line begin with a result that demonstrates the difficulty experienced by market conspiracies when operating in an oral double auction. In an oral double auction conspiracies are not especially effective. In view of Smith's results on the difficulties faced by a monopolist operating in such markets, it is not really surprising that a group attempting to behave like a monopolist would also have troubles. Isaac et al. (21) investigated the behavior of conspiracies when the market was organized as a posted offer as opposed to the oral double auction. The results demonstrate that under the posted offer institution conspiracies tend to be successful. The posted offer institution together with conspiracy is an effective way to maintain high prices.

In the eyes of a theoretician the problem faced by conspirators is similar to the problem faced by the public in the areas of pollution, environmental degradation, defense, and other common efforts (public goods). Oligopolists have a common interest in maintaining high prices. The problem is that each seller would prefer

that other sellers contribute to their "common good" by maintaining high prices while the seller in question charges a slightly lower price and captures as much of the market as is desired. Each seller has the same motivation to "free ride" on the decisions of others. The net result is that without facilitating practices, the "common good" is not easily attained. Similarly, in the case of environmental degradation, each individual has an incentive to allow others to carry the burden of a common goal of cleaning up the environment and the expense of "proper" effluence disposal. By "free riding" on the efforts of others the individual sees an opportunity to enjoy the benefits of the common goal while not accruing any of the costs. Each individual is in the same strategic position and, as a result, common purposes frequently do not get accomplished. The problem is well documented experimentally. Even when people are fully cognizant of the problem the collective goods tend not to be supplied.

If conspiracy and the facilitating practice of posted prices can help solve the free riding problem faced by conspirators, perhaps similar organization might help solve the free rider problem in other areas of collective action. The observation led Isaac and Walker (22) to study a process that combined a public meeting in which face-to-face conversations could take place together with a method of making nonbinding a private commitment to contribute toward a common goal. In the technical jargon they studied this "combined" mechanism as a means of financing a public good.

The results are promising in that the mechanism has greater

efficiency properties than any studied to date. For decades the free rider problem was believed to have no solution at all--in principle. For centuries arguments similar to modern theories have used free rider arguments to justify the coercive and taxing powers of government. The phenomenon has deep philosophical roots and is at the foundation of many theories of government. From a basic research and theoretical perspective, the results of Isaac and Walker will force a reconsideration of some widely held beliefs.

CLOSING REMARKS

Studies of the posted price institution demonstrate how basic research motivated by scientific curiosity can lead to many unanticipated applications. Posted prices tend to induce price contracts above the competitive equilibrium and also tend to induce market inefficiencies. The implications are direct for rate-posting regulatory arrangements. Indirectly the phenomenon has implications for antitrust and for theories of facilitating practices. The indirect consequences have also stimulated further experimental work on the public goods problem in public finance and political science. Perhaps most importantly the research demonstrates that laboratory experimental methods can be used in economics for basic, applied, and policy research. Such a demonstration presents a real challenge to the commonly held belief that as a matter of principle economics is not a laboratory science.

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23. The financial support of the National Science Foundation and the Caltech Center for Enterprise and Public Policy is gratefully acknowledged.